DOCUMENT RESUME

ED 037 103 FL 000 612

AUTHOR	Smith, W. Flint; Littlefield, Lael
TITLE	The Language Laboratory and the Electronic Classroom: A Comparison.
SPONS AGENCY	Indiana Univ., Bloomington. Indiana Language Program.
PUB DATE	Oct 67
NOTE	76p.
EDRS PRICE	EDRS Price MF-$0.50 HC-$3.90
DESCRIPTORS	Audio Active Compare Laboratories, Audio Active Laboratories, *Electronic Classrooms, Electronic Classroom Use, Electronic Equipment, Experimental Groups, *Experiments, Language Instruction, *Language Laboratories, Language Laboratory Equipment, Language Laboratory Use, Language Research, Language Skills, Reading Achievement, Research Projects, *Secondary Schools, *Second Language Learning

ABSTRACT

An experiment involving two groups of 193 beginning secondary school students of French, German, and Spanish considers the instructional value of the electronic classroom as an alternative to the conventional language laboratory for the presentation of exercise materials. Experimental design hypotheses state that since more practice is possible with recorded materials in the electronic laboratory than in the language laboratory, students using the former achieve more in listening, speaking, and reading skills. The experimental design includes discussion of the Modern Language Aptitude Test (MLAT), the Pimsleur Foreign Language Proficiency Tests, and the six-week interval unit tests. Extensive review of statistical analysis procedures, frequently accompanied by tables, favors the electronic classroom in 27 of 31 criterion-measured observable differences. A bibliography is furnished. (RL)

The Language Laboratory and the Electronic Classroom:

A Comparison.

Authors

Wm. Flint Smith
Purdue University
Lafayette, Indiana

Mrs. Lael Littlefield
Marion High School
Marion, Indiana

A Report to the

Indiana Language Program

for Research during
the 1966-67 academic year.

The Research Reported Herein Was
Supported by a Grant from the

Indiana Language Program

October, 1967

Acknowledgments

The authors would like to thank the officials of Marion Senior High School, Marion, Indiana, for their co-operation in carrying out this project. Specifically, for their support, a special thanks is extended to Mr. Paul Weaver, Principal of M.H.S., and to the participating teachers, James Brandenberg, Mrs. Beverly Carboneau, Mrs. Sharon Conyers, and Ernest Thode. Grateful acknowledgment is extended to Miss Jane Elgin, undergraduate Research trainee, for help in the collection and tabulation of the data.

Finally, the authors are grateful for the assistance provided by the Indiana Program, and for the invaluable insights and suggestions derived from many hours of conversation with Dr. Channing Blickenstaff of Purdue University, who served as consultant to the project.

Table of Contents

List of Tables

INTRODUCTION

Background of the Problem

The teaching of Modern Languages has undergone a rebirth of interest and a consequent re-evaluation of instructional techniques in the last fifteen years. The past two decades have seen the emergence of the ability to speak and to understand a foreign language as primary objectives, not only in and of themselves, but in addition, as sound and necessary bases for the acquisition of skill in reading and writing (Brooks, 1964; Lado, 1964; Rivers, 1964). It has now become a matter of national self-interest to increase the number of American citizens who can actively make use of a foreign tongue. (Parker, 1962).

Coinciding with the emergence of a new methodology and related instructional materials, the language laboratory has evolved as a useful adjunct to the teaching of foreign languages (Mathieu, 1962). It has been noted (Hayes, 1963, p. 18) that, unless the principal objectives of a language program are to engender active ability in speaking and understanding, there is no need to consider the installation of a language laboratory. On the other hand, the language instruction and a powerful aid to the establishment of behaviors underlying successful language learning where the four skills--listening, speaking. reading and writing--are equally and

continuously fostered during the entire language curriculum (Hocking, 1964; Hutchinson, 1964; Hutchinson, 1966).

Today, use of the language laboratory is well established and widely accepted in secondary school systens across the nation, a fact seen in the dramatic increase in their numbers from less than 50 to more than 10,000 in a space of some eight yeams (Birkmaier and Lange, 1967).

The application of the language laboratory for beginning language instruction is not without its problems however (Rivers, 1964; Scherer, 1965, Sawyer, 1964). Increasing enrollments in secondary schools, the expense of maintaining and expanding present laboratory installations, and difficulty in scheduling sufficient number of practice periods in the laboratory each week are problems facing language teachers and administrators alike (Hocking and Smith, mimeo). Many school systems have found it impossible to keep pace with demands for expansion. Several alternatives--radio (Cook, 1965), the telephone (Smith, 1967), and the school public address system (White, 1963)--have been offered to provide the language student with auditory materials for supplementary practice purposes; to date, results have beem largely disappointing or impractical.

It was the purpose of this research project to investigate another alternative to the language laboratory--the electronic classroom--and to compare its use and impact on achievement

of the conventional language laboratory.

Definition of Terms

The language laboratory in the context of this research was defined as an integrated group of electronic components designed to provide for and improve communication in a learning space. It included for the student (1) a booth for acoustical and visual isolation, (2) a tape recorder on which individual utterances could be recorded for comparison with a model, (3) a combination microphone-headset (audio-active), allowing the student to hear himself as others hear him. For the teacher there was a console with switches enabling him to (1) distribute taped lessons at will (program sources) and (2) to hear and to speak to any individual in the room without disturbing the others (monitor-intercommunication). The components of the conventional laboratory were installed in a learning space (satellite area) apart from the regular classroom into which students were scheduled during a portion of, or in addition to, the regular class period.

The electronic classroom was defined as an integrated group of electronic components installed within the modern foreign language classroom itself. Such an installation made posssible machine-guided practice during any class period without having to move the students about within the classroom or to take them en masse to a special room. The equipment included no booth for the student, but an audio-active headset-microphone at each desk; for the teacher there was a control

console containing progrom distribution and monitor-intercommunication switches as in the conventional laboratory. Of practical importance, all of the equipment was retractable, making the electronic classroom immediately convertible for other subject matter instruction; more importantly, the equipment was immediately accessible and allowed the teacher to distribute practice with recorded materials at those times when they would be most meaningful to the beginning language student. Im the context of this research, the electronic classroom lacked any individual record-playback machines for individual students; however, it is recognized that similar installations at times have a percentage of machines available for student use (Hayes, 1963).

At the outset, the electronic classroom seemed to offer at least four advantages in comparison with the conventional language laboratory: (1) more convenient access to materials permitting listening and speaking practice optimally spaced throughout the contact hour; (2) the elimination of scheduling problems; (3) the utilization of already existing space: (4) less expensive equipment and maintenance (about four electronic classrooms for the price of one conventional language laboratory).

Four disadvantages of the electronic classroom also were apparent (1) the student could not stop the tape and replay difficult passages; (2) he could not review a previous tape at will; (3) he could not record his voice for playback and comparison; (4) he did not have the isolation of a booth; instead, semi-isolation was achieved through an audio-activated headset.

These disadvantages were mitigated by two important factors. It has been implied that a fully-equipped language laboratory, providing for practice in recording and playing back given exercises, is of prime importance only when pronunciation accuracy is the major objective of a language program (Sawyer, 1964, p. 208-9). On the other hand, when a comparable rate of growth is undertaken in all four aspects of language ability, then a combination of experiences is desirable, and the necessity of record-playbeck is correspondingly reduced (Buch, 1963). Secondly by maintaining a small conventional installation to supplement the electronic classroom, any student desiring to use the drill tapes in a manner not possible in the electronic classroom could check out any of the entire series for individual record and playback use during the periods of the day when the laboratory was not in use.

The electronic classroom and the language laboratory differed primarily them, as follows: (1) the location and completemess of equipment; (2) the cost (3) the degree of integration with classroom activities; (4) the type of learning activities possible.

Gaarder (1960, p. 43) surveyed different techniques, approaches and learning conditions in the language laboratory and emerged with over 4000 possible combinations, among which were found the following independen factors:

I	1a attendance scheduled	1b attendance not scheduled
II	2a attendance compulsory	2b attendance voluntary
III	3a electronic self-monitoring	3b no electronic self-monitoring
IV	4a supervision	4b no supervision
V	5a recording facilities constantly available	5b recording facilities available for special purposes only
VI	6a unlimited availability of the machine-guided practice	6b limited availability of the machine-guided practice

Factors I through IV may br defined as an indication of the degree of integration of the classroom and the language laboratory; factor V defines the type of basic equipment, thus, the type of learning activities possible, and sets guidelines for the cost. Factor VIdefines the degree to which machine-guided practice may be distributed throughout the week; that is, in fixed periods on fixed days or at any time during normal classroom contact on any given day.

In this context, two conditions were available for investigation. Condition 1 (1a-2a-3a-4a-5a- 6b) and Condition II (1a-2a-3a-4a- 5b-6a). The independent variables therefore became (1) distributed versus non-distributed practice (6a vs. 6b) and (2) recording vs. no-recordiing as a learning activity (5a vs. 5b). These variables describe the essential differences between the two types of installations under investigation.

The problem under consideration, then, was to determine the extent to which the electronic classroom could be used successfully as an alternative to the conventional language laboratory for the presentation of language practice tapes where comparable rates of growth were desired in each of the four skills: understanding, speaking, reading and writing.

Marion Senior High School of Marion, Indiana was equipped with two conventional language laboratories and three electronic classrooms (as defined above). All five installations were designed to handle groups of up to thirty students. A four-year sequence was offered in each of three languages: French, German and Spanish.

RELATED RESEARCH

The Language Laboratory

Expensive language laboratory facilities have been installed amid controversy as to the use necessary to obtain effective results, the types of activity most advantageously practiced, the value of supervised versus unsupervised practice sessions, and the effect of equipment on methods of teaching.

Early attempts to evaluate the language laboratory and its impact upon beginning language learning proved largely inconclusive at all levels of instruction (Carroll, 1963, p. 1080). The majority of reports of successful use of the language laboratory have been reported within the last five years and emanate from the colleges and universities or from intensive language courses (Carroll, 1966, pp. 26-27). Few studies pertain directly to the secondary school.

Allen (1960) compared performance in hearing, speaking, reading, and writing between groups of high school language students working with and without the laboratory. The lab group spent one hour (20 percent of class time) in the laboratory each week for one year and achieved significantly higher in reading, vocabulary and grammar then the no-lab group, but not in listening or speaking. Allen concluded that more than one fifty-minute practice period per week would be necessary to develop any degree of oral performance.

Keating (1963) surveyed groups studying with and without the language laboratory in public secondary schools and reported that students

are differentially affected by their laboratory experience. The Keating report above all showed that students were not given enough time in the laboratory. Results of the survey clearly indicated that one forty-to-fifty minute lab period per week was insufficient in developing listening comprehension; however, it was apparently instrumental in sharpening speech production of first-year students (Blickenstaff, 1964).

Lorge (1964) carried out the most extensive and well-controlled investigation on the high school level with respect to language laboratories. Two successive experiments were designed: the first compared lab versus no-lab at three levels of instruction--first-, second-, and third-year. Results indicated differences in achievement developed at different levels. The laboratory group showed superiority in speaking and listening with no loss in reading and writing skills. Of interest to this investigation is that it was shown that spaced laboratory practice--at least two thirty-minute periods per week-- is the minimum contact permissable to allow the student to derive significant benefit.

A follow-up experiment by Lorge (1964) investigated two different types of language laboratory equipment--audio-active and redord-playback, each in two modes of presentation: once per week and thirty-minutes daily. Significant differences between groups resulted in favor of the group experiencing daily practice in both modes of presentation. Greater achievement in listening and speaking skills was

obtained by the group recording and playing back their responses each day. The group with audio-active practice daily gained almost as much as the record-playback group. In overall gains, the daily lab groups were superior to the no-equipment groups.

Hocking (1962) reported no significant difference in achievement between groups of beginning students at the college level who recorded and played back utterances while the control group continuously listened and responded to, but did not record, the same utterances. A comparison (Buck, 1963) at the secondary level yielded similar results and led to the conclusion that recording and playing back responses for comparison is of decidedly less importance when native-like pronunciation accuracy is not a major objective.

Young and Choquette (1965) in a highly controlled investigation studied the effects of type of equipment on language learning and were able to conclude that pronunciation can be improved through the use of audio-active headphones, although the differences observed between groups with immediate (audio-active) and delayed feedback (record-playback) were non-significant.

Johnson (1966) explored the relative efficiency of a single tape recorder and an audio-active non-record laboratory. Results of a comparison indicated no significant difference between groups practicing with the tape recorder in class or with machine-guided practice in the lab. Johnson concluded there is a need for fruther study as to what constitutes the most effective and efficient equipment

configuration.

To summarize, as indicated by Carroll(1966) and Birkmaier and Lange (1967), what is important is not the physical set-up of the laboratory but the amount of time the student is able to spend practicing with taped materials. The quality of the equipment continues to be an important factor, however, as do the teaching techniques and materials used in the lab.

Motivation

Motivation to learn has been shown to be one of the greatest factors, along with intelligence, contributing to success in foreign language learning (Pimsleur , 1962). Politzer (1960) concluded that assiduity in laboratory attendance on a voluntary basis or some related activity designed to improve speaking ability and auditory comprehension is positively correlated with achievement in language learning.

While independent use of the language laboratory is the mode most often found in colleges and universities, the application of the language laboratory in secondary schools is, for the most part, under direct teacher supervision where students attend the laboratory as a class (Bumpass, 1964).

Supervision (monitoring of student language efforts is a motivating factor according to Rivers (1964), a concept investigated and corroborated by Bauer (1964) who was able to conclude that

supervision (monitoring) of students' responses makes them work harder.

Neidt and Hedlund (1965) investigated attitude toward activities in the language laboratory during two scheduled periods each week. It was found that secondary school students felt best motivated to concentrate and presumably profit from machine-guided practice during periods of less than twenty-minute duration. Listening and responding were the most commonly preferred activities followed in order by listening comprehension, group conversation and testing.

Practice

Language learning requires specific and deliberate practice of all four skills. Practice affects both learning and retention and thus becomes one of the principal variables influencing one's ability to successfully comminicate in a foreign language.

Hutchinson (1966) noted that practice sessions utilizing the language laboratory must be frequent enough and long enough to develop the skills of speaking and listening. Stack (1966) recommends twenty- to thirty-minutes of intensive machine-guided practice each day as essential for the beginning language student, yet several broad field surveys have indicated that few schools with language laboratory installations are able to meet the recommended average (Bumpass, 1964; Keating, 1963; Gaarder, 1964)).

Ausubel (1963) reviewed the voluminous research with regard to the effects of practice on learning and retention. Although foreign

language learning was not mentioned specifically, the conclusions derived pertained to this investigation as follows: (1) the importance of frequency of practice could be seen overwhelmingly in the studies reviewed, irrespective of subject matter and the type of learning involved; (2) spaced practice was more effective than massed practice; that is, distributed practice effectively increased the clarity of newly learned materials, helped to minimize interference brought about by similar learning tasks, reduced fatigue and combated forgetting. In general, distributed practice was more efficient in facilitating learning than intensive practice without rest.

The following generalizations seemed tenable from a review of the related research: (a) the language laboratory and the electronic classroom are effective media for the presentation of practice exercise materials although the learning activities possible in each are determined by the complexity of the installation; (b) the physical set up where the students listen to and work with exercise tapes is relatively unimportant; (c) the amount of time spent with recorded materials is positively related to achievement in listening and speaking; (d) supervision or monitoring in the lab has a motivational effect upon the student; (e) the type of equipment best used as an adjunct to language instruction is determined by the major objectives of the program of instruction.

Still, several important questions remained unanswered: (a) What is the effect of continual practice in recording and playing back

responses? (b) What is the effect of distributed practice in listening and responding upon achievement in speaking and understanding a second language? (c) How is frequency and distribution of use of recorded materials related to their accessibility? (d) To what extent are scheduling problems reduced when equipment for machine-guided practice is installed in the modern language classroom rather than a satellite area? The investigation reported herein was addressed to questions (b) and (c) above.

OBJECTIVES

The purpose of the research was to determine the instructional value of the electronic classroom as an alternative to the conventional language laboratory for the presentation of practice exercise materials. Specifically, the purpose was to evaluate the following research hypotheses with respect to beginning instruction in French, German and Spanish. Given two systems as follows: (a) electronic classrooms where structural drills and related recorded materials accompanying the currently assigned lessons could be distributed for practice throughout the week whenever the teacher desired, and (b) a conventional language laboratory (apart from the regular classroom) where the language student practiced on assigned days of the week according to a predetermined schedule:

1. Practice with recorded materials would be more optimally distributed in system (a) than in system (b).

2. Students in system (a) would achieve more in listening, speaking, and reading skills than students in system (b).

The above research hypotheses were evaluated as statistical hypotheses, stated in the null form as follows:

1. There will be no difference in speaking ability in French between students in system (a) and (b).
2. There will be no difference in listening comprehension in French between students in system (a) and (b).
3. There will be no difference in reading ability in French between students in system (a) and (b).
4. There will be no difference in speaking ability in German between students in system (a) and (b).
5. There will be no difference in listening comprehension in German between students in system (a) and (b).
6. There will be no difference in reading ability in German between students in system (a) and (b).
7. There will be no difference in speaking ability in Spanish between students in system (a) and (b).
8. There will be no difference in listening comprehension in Spanish between students in system (a) and (b).
9. There will be no difference in reading ability in Spanish between students in system (a) and (b).

METHOD

Procedure

Two groups of students comprised the treatment conditions. Both groups were composed of male and female adolescents enrolled in beginning French, German and Spanish (level I) and attending Marion Senior High School, Marion, Indiana.

Treatment group I (T_1, electronic classroom) met in a classroom, especially equipped for and assigned to modern foreign language instruction, five fifty-five minute periods each week for presentation, explication and recitation of materials. At the teacher's control and without the student having to leave his seat, equipment for monitored, audio-active and machine-guided practice was lowered from the ceiling. There was no restriction placed upon the number of times the equipment was used each week, nor upon the distribution of practice with taped materials throughout the class period; however, the total weekly use of the equipment was limited to fifty minuted. Practice, thus, was optimally spaced according to the teacher's judgment.

Treatment group II (T_2, language laboratory) constituted the basis for comparison with the electronic classroom. Students comprising T_2 met in a modern foreign language classroom during five fifty-five minute periods each week. Laboratory periods were scheduled each week as part of the classroom hour. Students left their respective rooms and migrated <u>en masse</u> to one of two language laboratories for two twenty-five minute periods of supervised machine-guided practice. Whereas practice in T_1

was restricted to listening and responding to exercise materials, students in T_2 continuously recorded and played back their individual speech efforts during the two predetermined weekly lab periods.

Subjects

The beginning language students in the two treatment conditions under consideration would seem to represent a cross-section of secondary school foreign language students in comprehensive American high schools of enrollments less than 3000. Although the majority intended to pursue studies at the college and university level, there were a great many who elected to study a foreign language even though they were enrolled in a general, non-college preparatory course of study. Most students began their language study in the ninth grade; however, there were some tenth- and eleventh-graders as well. A small percentage had experienced Latin and/or foreign languages in the elementary school (FLES), either in the language they had chosen to study or in another. Most students, however, had had no previous contact with formal study of a second language and all students with previous language study were excluded from the final analysis.

DESIGN

The experimental design chosen for the study included the following paper-and-pencil and taped measuring instruments: The Modern Language Aptitude Test (MLAT), (Carroll and Sapon, 1958) administered as a pretest; the listening, reading and speaking

portions of the Pimsleur Foreign Language Proficiency Tests (Pimsleur, 1967) given as posttests in all three languages. In addition, unit examinations, seven in French and Spanish, and eight in German, administered at approximate six-week intervals over the school year, were also considered as criterion measures.

A statistical analysis was carried out on the resulting scores of the two groups of students in each language, one group of students having been taught with the help of the electronic classroom and the other group having received instruction with the help of the language laboratory. Of the original total sample of 193 students, 156 remained at the end of the school year. The distribution of the final sample of students in each language is summarized in Table I. Four students, one in French and three in Spanish were eliminated from the analysis because of prior contact with these languages. Some experimental mortality was noted; almost half the cases, however, were a result of scheduling conflicts a mid-year.[1] In no case did the number of dropouts appear to be related to the differences in treatment conditions. Moreover, the number of withdrawals and/or failures represented less than five per cent of the initial sample and appeared to be consonant with the average failure rate in beginning language classes at the secondary school level. Therefore, it can be assumed that the

[1]Nine students in French and seven in Spanish encountered scheduling problems and were forced to switch treatment conditions in January. All were dropped from the final analysis.

Table I

Distribution of Sample

	Initial	Final	Attrition
French			
Language Laboratory	42	36	-6
Electronic Classroom	41	34	-7
German			
Language Laboratory	42	36	-6
Electronic Classroom	28	23	-5
Spanish			
Language Laboratory	19	13	-6
Electronic Classroom	21	14	-7

Table II

Attrition From the Initial Sample

	Eliminated/ prior lang.	Withdrew/ Failed Sem. I	Schedule Conflict Sem. II
French			
Language Laboratory	1	2	3
Electronic Classroom	-	1	6
German			
Language Laboratory	-	6	-
Electronic Classroom	-	5	-
Spanish			
Language Laboratory	-	1	4
Electronic Classroom	2	3	4

consequent final sample of 85 language laboratory and 71 electronic classroom students remained essentially random despite the minor attrition reported in Table II.

A detailed description of the final sample is provided in Table III. Examination of the student characteristics by language and by total sample enhances the assumption of randomness of the two groups under investigation. Less than twenty per cent of the students comprising the treatment groups were enrolled in grades eleven and twelve; the majority were ninth and tenth-graders beginning second-language study at the customarily recommended level for secondary school students. All but eight of the students were between thirteen and sixteen years of age, further testimony that the subjects in the investigation were typical of high school students enrolled in the first year of modern languages.

Table IV further describes the sample with respect to their comparability on the pretest measures. The Modern Language Aptitude Test (long form) was administered during the first week of the 1966-67 academic year. Odd-even reliabilities of .90, .92, and .94 for grades nine, ten and eleven respectively are given in the 1959 Manual for the MLAT; validity coefficients are reported between .25 and .78 with course grade, the median validity being .51 for grades nine through eleven (Carroll, 1959, p. 12). Criterion related validities (see Table VIII-A-C) for the final sample

Table III

Description of the Sample

Characteristics	French		German		Spanish		Total	
	Lang.Lab (N=36)	Elec. Cl. (N=34)	Lang.Lab (N=36)	Elec. Cl. (N=23)	Lang.Lab (N=13)	Elec. Cl. (N=14)	Lang. Lab (N=85)	Elec. Cl. (N=71)
Sex:								
Male	17	13	19	16	4	8	40	37
Female	19	21	17	7	9	6	45	34
Age:								
13-14 yrs.	13	13	10	6	1	6	29	25
15-16 yrs.	18	21	21	16	10	8	49	45
17-18 yrs.	0	0	4	1	2	0	6	1
19 and older	0	0	1	0	0	0	1	0
Grade in school								
9th	18	11	12	6	1	6	31	23
10th	14	15	19	12	9	5	42	32
11th	4	8	3	5	1	3	8	16
12th	0	0	2	0	2	0	4	0
Previous language								
English (native)	36	34	36	23	13	14	85	71
Latin	3	4	4	3	11	2	8	9
French	0	0	0	2	1	0	1	2
German	0	0	0	0	0	0	0	0
Spanish	1	0	4	5	0	0	5	5
More than one language	0	0	0	0	0	0	0	0
Russian	0	0	0	0	0	0	0	0

with the MLAT ranged between .19 and .69 for unit tests and between .23 and .60 for course grades; median validities for the end-of-term achievement tests and six-week grades are summarized by language in Table IX.

An examination of Table IV reveals mean scores for the pretest favored the language laboratory group in both German and Spanish. A t-test indicated that the differences were indeed significant at the .01 level of confidence. Differences between groups in French did not reach significance at the .05 level, although the mean MLAT scores slightly favored the electronic classroom group. Therefore, pre-experimental equation of treatment groups, could not be assumed and thus, the decision was made to use covariance analysis, a statistical procedure which takes initial inequalities into consideration for all comparison made.

Although the ideal of sampling randomly from a broad population of secondary school language students could not be fully realized in the technical sense of the word, the resulting intact treatment groups in all other respects were considered reasonably representative of students enrolled in beginning language at the high school level.

Throughout the school year, at approximate six-week intervals, identical objectively-scored unit-examinations in each language were administered to the students in both treatment conditions. In addition, nine posttests, three in each language, were

Table IV

Characteristics of the Sample with Respect to the Pretest Measures

Language		N	Modern Language Aptitude Test		Interest*	
			$\bar{X}$	s	$\bar{X}$	s
French	Language Laboratory	36	91.333	11.546		
	Electronic Classroom	34	92.029	13.169		
German	Language Laboratory	36	98.11**	19.308		
	Electronic Classroom	23	90.61	17.595		
Spanish	Language Laboratory	13	105.23**	20.567		
	Electronic Classroom	14	86.43	18.813		

**p < .01

	F	df	Standard error	t	df
French	1.30	33.35	1.477	-.471	68
German	1.204	35.22	2.430	3.087	57
Spanish	1.175	12.13	3.78	4.973	12***

***t' corrected df for small sample (Winer, 1962, pp. 37-38)

*Not administered as pretest

administered during the last two weeks of the experiment. Table V summarizes these criterion measures and lists reliability information as reported in the respective manuals for the Pimsleur Language Proficiency Tests (Pimsleur, 1967, pp. 22-25). Reliability information was not obtained on the unit examinations; however, each unit test accompanying the regular classroom materials provided by the publishers had considerable content validity. Hence, scores derived from the unit examinations were compared between treatment groups in the respective languages under study as a check upon possible cumulative effects of being associated with either treatment condition.

Scores were obtained on seven unit tests in French and eight in German (one per chapter). The materials for Spanish included forty-four unit quizzes (two per chapter) the scores from which were regrouped into six composite tests, each composite covering approximately three textbook lessons and one six-week period. The regrouping procedure for Spanish was undertaken to increase the internal consistency reliability of the overall instruments through lengthening of the tests (Guilford, 1965, p. 465) and to reduce the data to more manageable proportions.

The nine posttests were objectively scored with the exception of the speaking portions. Each speaking test was subjectively scored twice, once by two judges in each language who worked independently of one another and in accordance with the

Table V

The Posttests and Their Reliabilities as Reported by the Test Manuals

Language	Skill	Name of Test	Coefficient	Grade	Type
French	Listening	Pimsleur French Listening Comprehension Form A (1967)	.74 .73	9 10-12	Odd-even corrected by Spearman-Brown
	Reading	Pimsleur French Reading Comprehension Form A (1967)	.84 .87	9 10-12	Odd-even corrected by Spearman-Brown
	Speaking	Pimsleur French Speaking Ability Form A (1967)	--- ---	9 10-12	Not published
German	Listening	Pimsleur German Listening Comprehension Form A (1967)	.76 .78	9 10-12	Odd-even corrected by Spearman-Brown
	Reading	Pimsleur German Reading Comprehension Form A (1967)	.81 .87	9 10-12	Odd-even corrected by Spearman-Brown
	Speaking	Pimsleur German Speaking Ability Form A (1967)	--- ---	9 10-12	Not published
Spanish	Listening	Pimsleur Spanish Listening Comprehension Form A (1967)	.73 .72	9 10-12	Odd-even corrected by Spearman-Brown
	Reading	Pimsleur Spanish Reading Comprehension Form A (1967)	.87 .88	9 10-12	Odd-even corrected by Spearman-Brown
	Speaking	Pimsleur Spanish Speaking Ability Form A (1967)	--- ---	9 10-12	Not published

Table VI

The Posttests and Their Reliabilities
as Obtained from Present Sample

Language	Skill	Name of test	Coefficient	Type
French	Listening	Pimsleur, Form A, 1967	.442	KR-20
	Reading	Pimsleur, Form A, 1967	.570	KR-20
German	Listening	Pimsleur, Form A, 1967	.736	KR-20
	Reading	Pimsleur, Form A, 1967	.787	KR-20
Spanish	Listening	Pimsleur, Form A, 1967	.747	KR-20
	Reading	Pimsleur, Form A, 1967	.687	KR-20

instructions for grading procedures set forth in the test manual. One important exception is noted, however: While the test manual recommends that the regular classroom teacher grade the speaking portions (Pimsleur, Manual, 1967, p. 13), none of the judges knew the students whose examinations they graded. Further, as an added precaution for anonymity, all individuals were identified by number rather than name. Indices of scorer reliability computed between the respective judges are reported in Table VII.

No reliability coefficients were reported in the test manuals for the speaking portions of the proficiency tests; moreover, the number of students for whom speaking scores were obtained was fairly small; thus the reliabilities computed between scorers are, at best, suspect. For this reason the speaking scores in all computation for each individual represented the mean of the two scores assigned by the judges.

A comparison of the post-tests and first-year instructional materials for high frequency vocabulary and representative structures revealed the Pimsleur battery contained more content validity than did the Modern Language Association Co-operative Classroom Tests originally selected as criterion measures (Smith, 1966, p.10). Moreover, Corroll (1966, p.34) pointed out that the elementary form (form L) has a negative skew with a heterogeneous population (such as that indicated by the pretest scores, see Table IV). Scores obtain barely above the chance level and do not sufficiently

Table VII

Interscorer Reliabilities of the Speaking Tests

		Scorer one		Scorer two		
Language	N	$\bar{X}$	s	$\bar{X}$	s	r_{12}
French	18	32.11	6.46	35.94	8.02	.9358
German	22	61.20	14.99	55.79	11.67	.7520
Spanish	18	53.15	9.05	50.85	8.80	.8985

Table VIII-A

Criterion-Related Validities for Modern Language Aptitude Test:

French

Criterion	N	r_{12}	$\bar{X}$	s
Unit test 2	70	.687	11.37	2.75
Unit test 4	70	.372	12.86	3.11
Unit test 6	70	.589	23.41	3.54
Unit test 7	70	.542	17.19	3.21
Unit test 8	70	.230	11.16	2.68
Unit test 9	70	.478	8.80	2.61
Unit test 10	70	.180	12.31	3.16
Pimsleur List.	70	.441	17.81	3.78
Pimsleur Read.	70	.372	11.04	3.39
Pimsleur Speak.	18	.253	35.31	6.75
Grade 1	70	.315	3.31	1.04
Grade 2	70	.419	3.64	0.96
Grade 3	70	.405	3.54	0.97
Grade 4	70	.407	3.44	1.01
Grade 5	70	.480	3.40	0.99
Grade 6	70	.394	3.30	1.01
Semester 1	70	.430	3.21	0.93
Semester 2	70	.538	3.24	0.92

$p < .05 = .2319$
$p < .01 = .3017$
$p < .001 = .3799$

(Text continued on page 32)

Table VIII-B

Criterion-Related Validities for Modern Language Aptitude Test:

German

Criterion	N	r_{12}	$\bar{X}$	s
Unit test 2	59	.453	14.71	2.60
Unit test 4	59	.505	14.15	3.46
Unit test 6	59	.610	19.12	5.02
Unit test 7	59	.241	15.71	5.45
Unit test 8	59	.446	18.47	3.98
Unit test 9	59	.462	15.71	4.07
Unit test 10	59	.367	23.62	4.94
Unit test 11	59	.377	15.45	4.48
Pimsleur List.	59	.687	17.96	5.91
Pimsleur Read.	59	.228	15.72	10.09
Pimsleur Speak.	22	.528	58.27	10.05
Grade 1	59	.418	3.88	0.85
Grade 2	59	.656	3.79	0.91
Grade 3	59	.533	3.40	1.34
Grade 4	59	.613	3.52	0.99
Grade 5	59	.598	3.47	1.23
Grade 6	59	.441	3.62	1.18
Semester 1	59	.493	3.59	1.19
Semester 2	59	.546	3.55	1.13

$p < .05 = .250$
$p < .01 = .345$
$p < .001 = .408$

(Text continued on page 32)

Table VIII-C

Criterion-Related Validities for Modern Language Aptitude Test:

Spanish

Criterion	N	r_{12}	$\bar{X}$	s
Comptest 1	27	.610	94.78	8.37
Comptest 2	27	.356	74.07	8.17
Comptest 3	27	.547	85.29	19.26
Comptest 4	27	.306	59.78	10.75
Comptest 5	27	.509	80.85	16.93
Comptest 6	27	.431	73.67	14.07
Comptest 7	27	.534	59.22	19.93
Pimsleur List.	27	.496	20.89	4.91
Pimsleur Read.	27	.601	11.44	4.77
Pimsleur Speak.	18	.711	51.72	9.11

Grades per six-week and semester not reported.

$p < .05 = .366$
$p < .01 = .469$
$p < .001 = .571$

(Text continued on page 32)

Table IX

Median Criterion-Related Validities

Language	N	Unit Tests	Six-week Grades
French	70	.441	.407
German	59	.453	.546
Spanish	27	.509	----

p < .01
p < .001

(Text continued on page 32)

discriminate between learners. Hence, the decision was made to use the more recent Pimsleur battery. In all cases the behaviors evaluated were those fostered throughout the run of the experiment: namely, the development of auditory comprehension, the ability to speak basic sentences with acceptable pronounciation, the ability to read with out translation, silently or aloud, and the ability to write what has been spoken.

An interest-attitude-motivation scale was not administered at the beginning of the 1966-67 experiment. Hence, it was impossible to draw any conclusions about the comparability of the treatment groups with regard to the intensity of their desire to learn a foreign language, nor was it possible to establish a baseline against which to compare potential attitudinal changes that might accrue throughout the school year. As the primary variable under investigation was the distribution of practice and as the treatment groups differed essentially only in this regard, it can only be assumed that the groups were comparable in interest and motivation at the inception of the school year and remained so throughout the investigation.

Nerertheless, and additional purpose of the investigation was to survey the attitudes of students toward the language laboratory and toward the electronic classroom. Correspondingly, a six-item questionnaire was divised (AppendixI) and administered at the end of the last six-week session. One question surveyed end-of -term

interest and motivation; two questions were designed to examine attitudes toward the electronic equipment; the three remaining items referred to study habits and preferred laboratory or electronic classroom activities. Four of the questions were of the forced-choice format: two were open-ended and allowed freedom of response. Although preservation of anonymity would have been preferable, identification of treatment group was achieved via the students' names. Total impunity of response was guaranteed , however, and the results, tabulated in Table X, are thought to be sufficiently honest and review language learning with the aid of supplementary media, and to serve as an aid in interpreting final outcomes.

Four teachers were involved in the experiment; each was under the direct supervision of the investigators for the total run of the experiment. Respective age, background data and teaching experience is summarized in Table XI. Only one of the teachers, in German, had had previous experience with the instructional materials used. Two of the remaining three individuals were new to the Marion School system; however, all had received instruction in or had previously taught the audio-lingual method and had been exposed to equipment for machine-guided practice. Two of the instructors, both in German, attended NDEA Institutes, where they received special instruction in the application of language laboratory equipment.

Table X

Student Attitude Inventory: Per Cent Response Each Category.*

	French		German		Spanish		Total	
	LL	EC	LL	EC	LL	EC	LL	EC
1. How interested are you in studying a foreign language?								
A. Very interested	26%	36%	31%	18%	21%	14%	26%	25%
B. Mildly interested	24	07	31	20	21	32	27	20
C. Not interested	03	04	—	—	04	08	01	01
2. Has the use of the electronic equipment, in your opinion, contributed to your progress in learning a foreign language?								
A. Yes	29%	20%	20%	18%	25%	18%	25%	20%
B. Undecided	12	13	24	12	14	21	16	15
C. No	12	12	16	10	08	14	12	12
3. With regard to the electronic equipment, would you prefer to								
A. Use it more?	17%	07%	16%	16%	13%	08%	17%	10%
B. Make no change in its use?	28	23	26	16	18	29	25	23
C. Use it less?	07	17	18	08	18	14	12	13

	Both groups
4. How do you prepare for each day's class?	
A. I never study.	30%
B. Less than 30-minutes at home or in school.	60
C. More than 30-minutes.	10
5. What activities do you enjoy most using the electronic equipment?**	
A. Dialog practice	56%
B. Recording voice	19
C. Listening only	06
D. No response	19
6. What activities do you enjoy least using the electronic equipment?**	
A. Dialog practice	11%
B. Recording voice	—
C. Taped tests	25
D. Drills	51
E. No response	13

*Based on total number of students present on final day of spring term: by treatment group LL=79, EC=67; by language: French LL=36, EC=33; German LL=30, EC=19; Spanish LL=13, EC=15.

**Responses (A-D) represent a summarization of comments to questions five and six with an open-ended format.

Table XI

Description and Characteristics of Teachers

Language	Sex	Age	Years Teaching	Degree(s)	Graduate/Institute
French	F	27	6	B.A. French and English, Ball State University, 1961.	M.A. English, Ball State University, 1967.
German	M	25	3	B.A. English and German, Purdue University, 1963.	Graduate Study, Stanford University, 1966,67; NDEA Institutes Summer, 1963 and 1964.
German	M	24	3	B.A. English and German, Ball State University, 1964.	M.A. German and English, Ball State University, 1966; NDEA Institute, 1967.
Spanish	F	23	3	B.A. Morehead University, Kentucky 1964; English and Spanish.	Graduate Study, Ball State University.

While one teacher in each of the three languages gave one class in each of the treatment conditions, scheduling difficulties precluded a more rigorous control of the instructor variable; that is, more than one teacher within each treatment condition in each language would have been desirable. Individual preference or special skill in manipulating one of the equipment configurations conceivably could have influenced the results of the experiment. Directional or significant differences between treatment groups must therefore be interpreted with caution.

Identical taped and/or visual materials were used in both treatment conditions within the three languages under investigation. Monitor-intercommunication facilities providing for individual communication between teacher and student without interruption of the entire class were available both in the language laboratory and the entire class were available both in the language laboratory and the electronic classrooms.

An attempt was made to co-ordinate classes across all participating teachers as far as possible between the two treatment conditions in an effort to minimize differences in handling the equipment. Yet differences in the application of the equipment within language become obvious upon examination of Table XII and Figure I. Students of Spanish received approximately sixty per cent more machine-guided practice than either French or German students. Such a large difference can only be explained in that the nature of the audio-visual instructional materials for Spanish required more contact with equipment

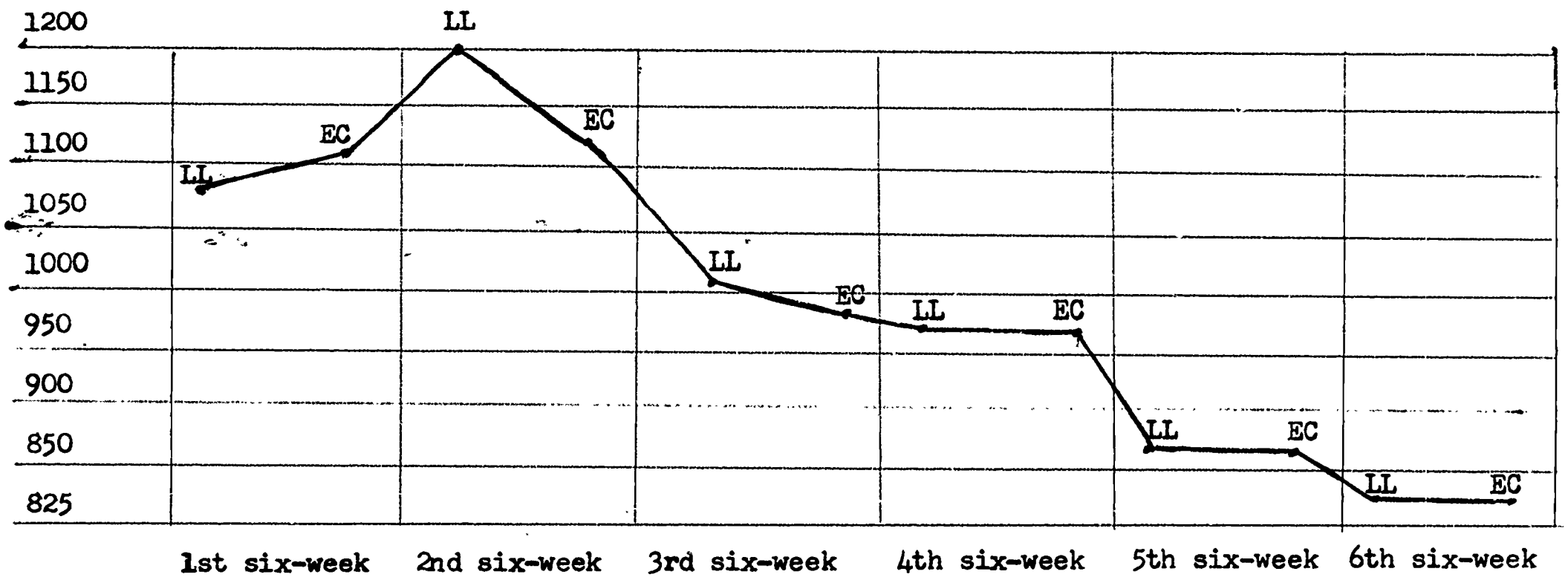
Table XII

Use of the Electronic Classroom and the Language Laboratory in Minutes (by Language)

Language	1st six-weeks		2nd six-weeks		3rd six-weeks		4th six-weeks		5th six-weeks		6th six-weeks		Total	
	LL	EC	LL	EC	LL	EC	LL	EC	LL	EC	LL	EC	LL	EC
French	300	300	450	450	250	250	300	300	190	190	150	150	1640	1640
German	316	360	302	242	307	289	240	240	240	240	240	240	1601	1612
Spanish	450	450	450	450	450	450	425	425	425	425	425	425	2625	2625
	1076	1110	1202	1142	1007	989	965	965	855	855	825	825	5866	5877

Figure I

Use of the Language Laboratory and the Electronic Classroom per six-week period.



for the presentation of films and related taped exercises. While the French and German teachers varied little in the total time the equipment was used, inspection of the total number of minutes across each six-week period reveals a definite trend towards less application of the equipment as the school year moved from beginning to end. This trend was also reflected in the attitude of the French and German teachers toward the use of the facilities. When asked to summarize personal preferences toward the two equipment configurations at the end of the year, statements such as "the equipment is an aid but somewhat of a bother--switching classrooms, locating tapes, etc." and "I find the laboratory in which the students can record has practically no advantage over the listen-repeat type laboratory," reflected an apparent decreasing motivation to apply split-period scheduling, record-playback and associated activities. One instructor stated flatly, "I prefer the electronic classroom." As all teachers were required to use the laboratory and the electronic classroom an equal amount of time, a decrease in the use of the language laboratory also caused a decrease in the total amount of time the electronic classroom could be used for machine-guided practice. Distribution of practice with taped exercises during the week was reduced, evidently, to a rate comparable with the number of scheduled visits the laboratory group made to the language laboratory. Practice throughout the class period was not affected, however, and presumably continued to be optimally distributed as the teachers saw fit. Taking all three languages

into consideration, only eleven minutes total difference in machine-guided practice was noted (5866 to 5877)[2] between the language laboratrory and the electronic classroom groups; similar totals noted between treatment groups per language with in each six-week period strengthens the observation that the assumption of equal time spent with taped materials was met by all groups under investigation.

The textbooks and corresponding tapes were commonly used and modern approaches to the study of foreign languages; for French and German, the A-LM Materials, (1962); for Spanish, (EBF) La Familia Fernández, (1963). Both sets of materials were conceived and developed in congruence with modern linguistic principles: Each text places emphasis on the listening and speaking skills; equal stress in reading and writing is given after an initial period of training in the rudiments of the sound system, auditory comprehension and speech production. The only basic difference between the two textbooks is that the latter by Encyclopedia Britannica (EBF) bases its entire presentation on the desirability of a visual adjunct in language learning. Hence, the Spanish materials included films and filmstrips, one per lesson, in addition to printed matter and tapes. While the A-LM Materials used no correlated visuals, audio taped materials were indeed correlated with each textbook lesson in both French and German. Designed for regular use, their purpose was to reinforce classroom presentation of dialogs, vocabulary and structural

---

[2] By language: French, 1640-1640; German, 1601-1612; Spanish, 2625-2625.

patterns of language; pattern drills requiring repetition, substitution and transformation of model sentences systematically reviewed and augmented classroom drill. Reading and writing were developed after inculcation of the fundamental skills for speaking and understanding; however, reading activity was limited to what the student had already learned to say and to understand. Dictations were by far the more prominent form of writing exercise and again were primarily based upon materials apprehended through the ear and the eye and in which the student was expected to exhibit control over the dialog structures, vocabulary and situational components. In short, the greatest part of student activity was spent in responding to stimuli received audially and visually. Neither method is designed to foster extemporaneous speaking at this level; rather, the teacher is advised to make the recorded materials an integral part of the lesson plan each day, systematically, throughout the instructional period, (A-LM Teacher's Manual, 1961, p. 32), thus, the tapes contained materials for listening practice and sound-symbol association as well as for imitation.

Criterion Measures

The unit examinations administered to the treatment groups were identical within each language and tested two basic behaviors: listening comprehension and reading ability. Objectively-scored quizzes from the A-LM Teacher's Manual for French and German measured the student's ability to understand questions and situations from the dialogs when presented in a direct or transformed context. Each unit test was

composed of between fifteen and twenty-five multiple choice items. In the latter case, the classroom teacher supplemented the textbook quiz with similar items of his or her own making. The objective format was observed in all cases and the items were designed to evaluate an understanding of "who's speaking," simple vocabulary, and common rejoinders; thus, the student heard or read the stem of each item and chose one of four distractors as the best answer to the question or incomplete sentence posed.

Unit quizzes in Spanish approximated the format of the A-LM Materials; however, there were two quizzes per lesson. The first consisted of a taped scrambling of the lines of the dialog. The student indicated which sentence of the dialog was uttered by referring to a picture cue-card and then encircling the corresponding numeral on his answer sheet. Test one measured how well the student had learned the basic dialog before progressing with the structural and vocabulary drills of the lesson; its format was basically one of recognition. Test two, given at the end of each lesson, similarly measured assimilation of materials via a scrambling technique of the dialog sentences; however, the student had to reconstruct the conversation from cues given, thus testing his ab lity to recall structure and vobabulary simultaneously. A picture cue-card again was used in the same fashion as described above, as was an objectively scorable answer-sheet.

Each teacher in addition supplemented the unit tests with individually prepared quizzes. The quiz items included dictations, the

writing of complete sentences in conformity with given patterns or in response to voiced or tape auditory stimuli. A similar number of supplementary quizzes was given within each language; however, their type and wieght in grading was only minimally controlled by the investigators. To arrive at grades, a composite evaluation was made of the quiz scores, unit tests and overall recitation within each six-week period. The final grade, in turn, was determined by a summation of all six-week scores.

Although the students were not told that they were involved in an experiment, it was inevitable that certain differences in procedure form years past be noticed. Thus, while the content of each treatment condition within each language remained constant, the administration of pretests (even though explained as a necessary source of information for departmental records), differential distribution of time for machine-guided practice and end-of-course evaluations may have produced a limited Hawthorne effect. Nevertheless, since the entire population of students enrolled in beginning French, German, and Spanish (but not Russian) was administered pretests, and since differential distribution of practice with taped materials was explained as being simply a logical application of the two equipment configurations, the degree of reactivity to the experimental conditions seemed minimal at most.

The administration of the Pimsleur achievement battery during the final weeks of the spring term coused some reactivity to testing

conditions. All students in the three languages under investigation took the listening and reading portion; however, it was impossible to administer the speaking test to all. Hence, thirteen students in each treatment condition for each language were randomly chosed to take the speaking tests. A lack of application to the test is clearly indicated on several of the examination tapes in French; moreover, incomplete information and equipment malfunctions during the recording of the students' responses in other languages reduced the number of usable test tapes to less than ten per group in several instances.

RESULTS AND CONSLUSIONS

The data for the unit and post-tests in each language were subjucted to a one-way analysis of covariance with unequal n's in cells as described by Winer (1962, pp. 578-94); that is, an analysis of covariance was performed for a single factor treatment classification where there was one measured variable (Y) and one concomitant variable (X). The Modern Language Aptitude Test was the covariate (X) in all cases.

The validity of covariance analysis to an experimental situation requires that two a priori mathematical assumptions be established: homogeneity of variance, and homogeneity of regression. Preliminary tests on the data for these assumptions, summarized in Tables XIII A-C justified the use of covariance analyses.

The resulting criterion and post-test means for each language as adjusted for initial differences on the pretest (ML_AT) are listed in

Table XIII-A

F Statistics for French
Assumptions for Covariance Analyses

Test	F*	df	p	F**	df	p
1	0.100	1,66	N.S.	58.472	1,67	.01
2	0.262	1,66	N.S.	10.723	1,67	.01
3	0.544	1,66	N.S.	34.535	1,67	.01
4	0.906	1,66	N.S.	27.071	1,67	.01
5	0.288	1,66	N.S.	3.174	1,67	.10
6	1.100	1,66	N.S.	19.564	1,67	.01
7	0.090	1,66	N.S.	3.527	1,67	.10
8	0.151	1,66	N.S.	15.614	1,67	.01
9	0.068	1,66	N.S.	10.110	1,67	.01
10	0.040	1,14	N.S.	0.022	1,14	N.S.

$F_{.10(1,66)}=2.79$

$F_{.10(1,14)}=3.10$

$F_{.10(1,67)}=2.79$

$F_{.05(1,67)}=3.98$

$F_{.01(1,67)}=6.82$

$F_{.05(1,14)}=4.60$

* If the obtained F<tabled value, accept $H_1: B_1=B_2=\ldots=B_k$; that is, there is homogeneity of within cell regression.

** If the obtained F>tabled value, reject H_1: B=0; that is, the overall regression is zero.

(Text continued on page 47)

Table XIII-B

F Statistics for German
Assumptions for Covariance Analyses

Test	F*	df	p	F**	df	p
1	1.204	1,55	N.S.	15.366	1,56	.01
2	1.194	1,55	N.S.	24.900	1,56	.01
3	0.263	1,55	N.S.	35.471	1,56	.01
4	0.148	1,55	N.S.	5.732	1,56	.05
5	0.377	1,55	N.S.	14.045	1,56	.01
6	0.250	1,55	N.S.	16.089	1,56	.01
7	1.230	1,55	N.S.	13.847	1,56	.01
8	0.032	1,55	N.S.	10.617	1,56	.01
9	0.436	1,55	N.S.	51.285	1,56	.01
10	0.007	1,55	N.S.	2.721	1,56	N.S.
11	0.585	1,18	N.S.	7.084	1,19	.05

$F_{.10(1,55)}=2.82$

$F_{.10(1,18)}=3.01$

$F_{.10(1,56)}=2.76$

$F_{.05(1,56)}=3.91$

$F_{.01(1,56)}=4.54$

* If the obtained F<tabled value, accept H_1: $B_1=B_2=\ldots=B_k$; that is, there is homogeneity of within cell regression.

** If the obtained F>tabled value, reject H_1: B=0; that is, the overall regression is zero.

(Text continued on page 47)

Table XIII-C
F Statistics for Spanish
Assumptions for Covariance Analyses

Test	F*	df	p	F**	df	p
1	1.218	1,23	N.S.	16.319	1,24	.01
2	0.011	1,23	N.S.	3.679	1,24	.10
3	0.000	1,23	N.S.	9.679	1,24	.01
4	2.717	1,23	N.S.	2.503	1,24	N.S.
5	0.061	1,23	N.S.	8.697	1,24	.01
6	1.203	1,23	N.S.	6.260	1,24	.05
7	0.080	1,23	N.S.	11.194	1,24	.01
8	0.477	1,23	N.S.	8.221	1,24	.01
9	0.154	1,23	N.S.	8.426	1,24	.01
10	0.355	1,14	N.S.	12.867	1,15	.01

$F_{.10(1,23)}=2.94$

$F_{.10(1,14)}=3.10$

$F_{.10(1,24)}=2.93$

$F_{.05(1,24)}=4.26$

$F_{.01(1,24)}=7.28$

$F_{.01(1,15)}=8.68$

* If the obtained F<tabled value, accept H_1: $B_1=B_2=\ldots=B_k$; that is, there is homogeneity of within cell regression.

** If the obtained F>tabled value, reject H_1: B=0; that is, the overall regression is zero.

(Text continued on page 47)

Tables XIV A-C Inspection of the criterion measures for French revealed two significant differences between treatment groups with regard to the unit tests, one each favoring the electronic classroom and the language laboratory. While the differences may be considered as self-cancelling, the direction of the differences on all other unit tests and on the three Pimsleur tests, though not significant, clearly favored the electronic classroom. In German, four significant differences between treatment groups were obtained. Inspection of Table XIII-B reveals that the electronic classroom group achieved consistently more on the unit tests than the language laboratory group, and significantly so in four of the eight measures. As in the case for French, non-significant differences were observed on the end-of term criterion measures. One reversal in the directional trend, in reading achievement, was also noted. Table XIII-C lists the adjusted criterion measures for Spanish. While no significant differences were observed on any of the composite unit tests, a directional difference favoring the electronic classroom group was noted on all but two criterion measures, the latter in the case of reading achievement and speaking ability.

Finally, when viewed across the two treatment conditions, irrespective of language, fully twenty-seven of the thirty-one observed differences in criterion measures are in the direction of the electronic classroom. Of the four instances where there are reversals of this trend, two are with regard to reading achievement and all reversals

Table XIV-A

Results of Covariance Analyses of Differences Between Groups for Ten Posttests: French

Variable	Adjusted Means for Electronic Classroom (N=34)	Adjusted Means for Language Laboratory (N=36)
1. Unit test 2	11.585	11.170
2. Unit test 4	14.419**	11.382
3. Unit test 6	24.089	22.796
4. Unit test 7	17.337	17.043
5. Unit test 8	11.672	10.670
6. Unit test 9	8.902	8.792
7. Unit test 10	11.594	13.184*
8. Pimsleur Listening	18.022	17.618
9. Pimsleur Reading	11.422	10.685
10. Pimsleur Speaking	34.363 (N=7)	31.951 (N=11)

*$F_{.05(1,67)}=3.98$

**$F_{.01(1,67)}=6.82$

(Text continued on page 51)

Table XIV-B

Results of Covariance Analyses of Differences Between Groups for Eleven Posttests: German

Variable	Adjusted Means for Electronic Classroom (N=23)	Adjusted Means for Language Laboratory (N=36)
1. Unit test 2	15.109	14.458
2. Unit test 4	14.176*	13.655
3. Unit test 6	19.388	18.857
4. Unit test 7	18.499**	13.931
5. Unit test 8	18.661	18.355
6. Unit test 9	16.288	15.344
7. Unit test 10	26.301**	21.919
8. Unit test 11	16.529*	14.773
9. Pimsleur Listening	18.520	17.612
10. Pimsleur Reading	13.968	16.854
11. Pimsleur Speaking	58.965 (N=9)	57.793 (N=13)

*$F_{.05(1,56)}=3.91$

**$F_{.01(1,56)}=7.19$

(Text continued on page 51)

Table XIV-C

Results of Covariance Analyses of Differences Between Groups for Ten Posttests: Spanish

Variable	Adjusted Means for Electronic Classroom (N=14)	Adjusted Means for Language Laboratory (N=13)
1. Comptest 1	96.475	92.950
2. Comptest 2	74.917	73.166
3. Comptest 3	87.067	83.389
4. Comptest 4	60.564	58.931
5. Comptest 5	83.457	78.004
6. Comptest 6	75.267	71.267
7. Comptest 7	63.153	54.989
8. Pimsleur Listening	21.546	20.181
9. Pimsleur Reading	10.495	12.181
10. Pimsleur Speaking	51.582 (N=9)	51.862 (N=9)

*$F_{.05(1,24)}=4.26$

**$F_{.01(1,24)}=7.28$

(Text continued on page 51)

were obtained on the end-of-term measures. The strength of the directional trend in favor of the electronic classroom was verified by means of a Sign-test for large samples (N=31) as described by Siegel (1956, pp. 68-75). The hypothesis tested, that the median change in the observed differences is zero, was rejected at the .001 level of confidence.[3] The reasons for the directional trend favoring the language laboratory inGerman and Spanish with regard to reading achievement are not readily apparent and need further investigation.

Whatever the explanation, it is evident from the data that the electronic classroom groups tended to out-perform the language laboratory groups. The flexibility of the electronic classroom was apparently instrumental in providing the students with more effective periods of machine-guided practice; specifically, practice in listening and responding was probably more advantageously distributed within each class period and during the week than in the language laboratory groups. As the dialogs for each lesson were presented by the teacher, the taped version could be immediately presented for reinforcement of meaning, pronunciation and intonation patterns. Similarly, as the student became more conversant in the manipulation on the dialog, structural drill on tape could be presented to reinforce and guide variations of basic grammar patterns and idiomatic

---

[3] $P(X_A > X_B) = P(X_A < X_B) = \frac{1}{2}$

expressions. While the recording of responses for later playback and comparison was not possible due to the basic nature of the equipment configuration for the electronic classroom, it appears the sacrifice in recording was worth the gain of immediate access to taped materials: The time loss and attention lag which accompany class migrations from classroom to language laboratory was completely overcome.

In summary, with respect to the research hypotheses posed (see page 14 above), that students in the electronic classroom would achieve more in listening, speaking and reading skills than those studying with the aid of the language laboratory, was indeed upheld on the basis of the directional trend noted. Hypothesis two, that practice with recorded materials would be more optimally distributed in the electronic classroom than in the language laboratory also seems to have been corroborated; however, the optimum parameters of distributuon of practice need to be ascertained. Actual patterns of machine-guided practice under each treatment condition are currently the subject of further investigation.

Non-parametric statistics were applied to the analysis of the student attitude inventory. Tallies for items one through three (How interested are you in studying a foreign language? Has the use of the electronic equipment contributed to your progress in learning a foreign language? Would you prefer to use the electronic equipment more or less?) were subjected to chi

square analyses (hypothesizing no difference between treatment groups). Differences did not reach significance at the .05 level of confidence when the data were evaluated for all three languages in combination (Table XV-A); however, a by-language analysis of responses to the same questions revealed two significant differences for French (Table XV-B). Students in the electronic classroom group indicated greater interest in studying French than their language laboratory counterparts. While more positive attitudes toward the study of French might be related to the optimal sequencing of practice exercises for auditory comprehension and speech production, a feature inherent in the electronic classroom, in actuality, it may simply reflect the general trend of the electronic classroom groups of scoring higher than the language laboratory groups on unit and end-of-term criterion measures. Other interpretations are suspect in light of the few students who indicated they spent more than thirty minutes in daily preparation of assignments (see below, p.61).

Inspection of the relative percentages of responses to questions two and three in French (Table X) in both cases reveals that students in the language laboratory group reacted more positively towards their experience with machine-guided practice, and indeed, indicated a significant difference toward greater use of the equipment in the future (Table XV-B). Furthermore, this preference for more use of the electronic equipment appears to be someqhat related to the type of activity withinsthe language laboratory period.

Table XV-A

Chi-square Analyses of Frequency Data from Student Attitude Inventory.[1]

All Languages

1. Question I: End-of-term interest.

	LL	EC
very interested	39	38
mildly interested	40	29

$\chi^2_{1df} = .785$

α = .05(3.84); difference is N.S.

2. Question II: Contribution of equipment

	LL	EC
yes	37	27
undecided	24	22
no	18	18

$\chi^2_{2df} = .684$

α = .05(5.99); difference is N.S.

3. Question III: Use of equipment more or less.

	LL	EC
more	25	14
undecided	36	34
less	18	19

$\chi^2_{2df} = 2.01$

α = .05(5.99); difference is N.S.

---

[1] Based upon $\chi^2 = \frac{N(|AD-BC| - N/2)^2}{(A+B)(C+D)(A+C)(B+D)}$

Table XV-B

Chi-square Analyses of Frequency Data from Student Attitude Inventory.[1]

French

1. Question I: End-of-term interest. (Categories B,C, Combined).

	LL	EC
very interested	18	25
mildly interested	18	8

$\chi^2_{1df} = 4.86^*$

$\alpha = .05(3.84)$; difference is significant $p < .05$

2. Question II: Contribution of equipment.

	LL	EC
yes	20	14
undecided	8	9
no	8	10

$\chi^2_{2df} = 1.82$

$\alpha = .05\ (5.99)$; difference is N.S.

3. Question III: Use equipment more or less.

	LL	EC
more	12	5
undecided	19	16
less	5	12

$\chi^2_{2df} = 5.99^*$

$\alpha = .05\ (5.99)$; difference is significant $p < .05$

.. Question III: Category B (undecided) disregarded.

	LL	EC
more	12	5
less	5	12

$\chi^2_{1df} = 4.24^*$

$\alpha = .05(3.84)$; difference is significant $p < .05$

---

[1]Based upon $^2 = \frac{N(|AD-BC| - N/2)^2}{(A+B)(C+D)(A+C)(B+D)}$

Further inspection of Table X reveals that students preferred using the equipment for exposition of the dialogs and, in the case for the language laboratory group, for the opportunity to record and playback theirvoices. On the other hand, drills of the substitution and repetition variety were disliked by half of the resopndents. Students in the electronic classroom had but limited opportunity to record their voices for comparison wtih a model and, in two free-response items included on the questionnaire, several students regretted the lack of opportunity for this type of activity. Moreover, one of every four students in the language laboratory groups mentioned recording as being an enjoyable activity. One would suspect that perhaps recording and playing back responses for comparison has largely a motivational effect on students enrolled in non-intensive language courses.

The significant preference of the language laboratory group in French for more use of the equipment is in apparent contradiction with the directional trend of the results noted for the electronic classroom. Two plausible explanations may be offered: first, laboratory students may have wanted more practice because they felt the two scheduled twenty-five minute periods per week were inadequate in preparing them for the listening and speaking behaviors required for optimal class participation and successful achievement on quizzes and exams. That is, the laboratory experience was viewed as a motivating experience; however, the visits

were too short and too infrequent. Secondly, the laboratory students may have found the manipulation of the tape recorders and the semi-isolation provided by booths a motivation and satisfying experience in themselves; record playback availability may have been construed as contributory to day-by-day progress, thus prompting the number of positive responses to question two. The desire of the electronic classroom students to use the equipment less is indeed puzzling. One can only postulate that in the students' opinions machine-guided practice may have been distributed in such a way that "live" teacher-student interaction was reduced excessively. Again, investigation of what constitutes optimal distribution of practice is in order.

The German and Spanish treatment groups expressed equal interest in language study and reacted similarly (Table XV-C and XV-D) toward the equipment. The pattern of responses was somewhat similar to the French group. More language laboratory than electronic classroom students felt machine-guided practice had contributed to their progress; however, difference between groups were non-significant. A slight directional preference for less use of the equipment, noted above for French, was reversed for Spanish and German. Overall responses to questions one through three support a slight directional attitudinal preference for the language laboratory. Viewed within each language, however, the directional preference is not constant. More investigation is needed with regard to affective responses to the language laboratory in general.

Table XV-C

Chi-square Analyses of Frequency Data from Student Attitude Inventory.[1]

German

1. Question I: End-of-term interest.

	LL	EC
very interested	15	9
mildly interested	15	10

$\chi^2_{1df} = .032$

$\alpha = .05(3.84)$; difference is N.S.

2. Question II: Contribution of equipment.

	LL	EC
yes	10	9
undecided	12	6
no	8	4

$\chi^2_{2df} = 2.13$

$\alpha = .05(5.99)$; difference is N.S.

3. Question III: Use the equipment more or less.

	LL	EC
more	8	8
undecided	13	8
less	9	3

$\chi^2_{2df} = 1.5$

$\alpha = .05(5.99)$; difference is N.S.

---

[1]Based upon $\chi^2 = \frac{N(|AD-BC| - N/2)^2}{(A+B)(C+D)(A+C)(B+D)}$

Table XV-D

Analyses of Frequency Data from Student Attitude Inventory.[1]

Spanish

1. Question I: End-of-term interest.[2] (Categories B,C, combined).

	very	mildly interested
Electronic Classroom	4 A	11 B
Language Laboratory	6 C	7 D

Critical value of D in Fisher test[3] D<6 (.05).

Dobs. =7, thus difference is N.S.

2. Question II; Contribution of equipment.[4]

	yes	no
Electronic Classroom	8 A	7 B
Language Laboratory	9 C	4 D

Critical value of D in Fisher test[5] D<0 (.05).

Dobs. =4, thus difference is N.S.

3. Question III: Use the equipment more or less:[6]

	more	less
Electronic Classroom	6 A	8 B
Language Laboratory	5 C	8 D

Critical value of D in Fisher test[7] D<1 (.05).

Dobs. =8, thus difference is N.S.

Footnote 1-7 are on page 60.

Table XV-D (continued)

[1]When expected frequencies are small, the Fisher Exact Probability Test is the appropriate technique for analyzing discrete data, Siegel, (1956), p. 97-101.

[2]Original matrix

	LL	EC
very	6	4
mildly	7	11

recast into very mildly

	very	mildly
EC	4	11
LL	6	7

[3]Siegel, (1956), pp. 97-101, 259.

[4]Original matrix combined

	LL	EC
yes	7	5
undecided	4	6
no	2	4

and recast

	LL	EC
yes	9	8
no	4	7

, recast

	Yes	No
EC	8	7
LL	9	4

[5]Siegel, (1956), pp. 97-101, 268.

[6]Original matrix

	LL	EC
more	3	2
undecided	5	8
less	5	4

recombined

	LL	EC
more	5	6
less	8	8

and recast

	more	less
EC	6	8
LL	5	8

[7]Siegel, (1956), pp. 97-101, 265.

A summary analysis of question four (How much time do you spend in preparation of each day's lesson?) revealed that the majority of students in both treatment conditions were only marginally interested in language study. Tabulation of the responses revealed that but ten per cent of the beginning language students spent more than thirty-minutes each day in homework assignments; fully thirty per cent said they never studied at all. While lack of motivation and/or assiduity to study may reflect a teacher variable, it would seem best explained as but another indication of the secondary importance American high school students place upon achievement in modern foreign languages as noted by Lambert (1963, p. 118) in his study of student's values in the language-learning process. Furthermore, significant differences in stated interest toward language study (question one) become suspect in light of these results.

Responses to questions designed to elicit an indication of student attitude toward type of activities carried out in the language laboratory and the electronic classroom revealed positive feelings toward exercises for the learning of dialogs (listening and repeating); however, a decidedly negative feeling toward substitution and transformation exercises was voiced by over half of the respondants, and another twenty-five per cent disliked "tape recorded tests." Finally, ten per cent commented on the "tightness" and "lack-of-comfort" of the microphone-headset combinations.

The negative attitudes toward machine-guided practice, in general, seemed associated more with a general concern for grades than for the

development of a genuine ability in the respective language. This observation is supported by the one-in-four who voiced an opinion against the tape-guided tests coupled with the same overall percentage that thought electronic equipment did not contribute to achievement in learning a second language.

Eac' participating teacher was invited to submit his or her opinion with regard to the language laboratory and the electronic classroom. In general, the opinions submitted tended to reveal a teacher preference for the electronic classroom, a fact which may account for the significant trend in its favor. More positive attitudes toward the electronic equipment in general were voiced by the Spanish teacher. Considerable less use of the equipment, as indicated in Table XII for French and German, perhaps reflects neutral or negative attitudes. Although the equipment was used less and less over the school year, machine-guided practice within the class period and within each six-week period was evidently optimally spaced.

RECOMMENDATIONS FOR FURTHER RESEARCH

For the Language Laboratory:

An investigation of the type of activities carried out within the laboratory period is needed. The relative value of listening exercises, dictations, comprehension drills and the like needed to be determined; furthermore, variations in the type of exercises should be evaluated for potential influence on achievement in the four skills. Of great importance is a more efficient integration of the language laboratory

with the master schedule for all classes. How can the laboratory be used more efficiently throughout the day? What steps can be taken to use the laboratory for independent study as well as for supervised taped guided practice?

For the Electronic Classroom:

Although the value of the electronic classroom has been indicated and corroborated to a large degree in the present research, further study into its use is also needed. Specifically, the distribution of practice periods throughout week and six-week intervals need to be surveyed. The type of learning activity within each practice period needs clarification; finally, the directional trend of the electronic classroom installation over the language laboratory should be verified, a cost analysis performed, and recommendations made for secondary schools similar to Marion High School.

For Recording and No-recording:

Further investigation is needed into the impact of recording versus no-recording. By design, the opportunity to record (see page X above) was nested within the respective treatment conditions, which in turn were predetermined by the equipment configuration available for investigation. It could be that systematic record and playback on a limited basis in conjunction with the facility to distribute practice afforded by the electronic classroom would have an even greater impact upon achievement. Two situations for further investigation thus obtain:

one, a comparison of classes taught with and without record playback opportunity; two, a comparison of classes taught using only the electronic classroom with classes taught utilizing both facilities--that is, the electronic classroom used to distribute tape-guided practice at the most advantageous moment and the language laboratory used as an out-of-class library for the preparation of aural-oral homework assignments.

APPENDIX

Name_____ _____
Last First

Language_____ Teacher _____

1. How interested are you in studying foreign languages? Encircle one.

   A. Very interested
   B. Can take it or leave it
   C. Not interested

2. Has use of the electronic equipment, in your opinion, contributed to your progress in learning a foreign language? Encircle one.

   A. Yes
   B. Undecided
   C. No

3. With regard to the electronic equipment, would you prefer to

   A. Use it more often
   B. Make no change
   C. Use it less often

4. How do you prepare for each day's class?

   _____

   _____

   _____

5. What type of activities in using the electronic equipment do you enjoy most?

   _____

   _____

6. What activities do you enjoy least in using the electronic equipment?

   _____

   _____

APPENDIX II

Intercorrelation Matrix: French

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. MLAT	1.000	.687	.372	.589	.542	.230	.478	.186	.441	.372	.253	.315	.419	.405	.407	.480
2. Unit test 2		1.000	.728	.851	.814	.337	.438	.232	.478	.399	.606	.585	.783	.719	.733	.784
3. Unit test 4			1.000	.688	.636	.331	.180	-.015	.340	.314	.506	.533	.689	.630	.658	.644
4. Unit test 6				1.000	.867	.406	.376	.228	.396	.369	.306	.604	.813	.775	.782	.826
5. Unit test 7					1.000	.342	.359	.265	.437	.357	.575	.537	.768	.715	.700	.792
6. Unit test 8						1.000	.331	.372	.290	.315	-.059	.205	.453	.400	.420	.306
7. Unit test 9							1.000	.181	.309	.366	-.060	.199	.414	.294	.389	.448
8. Unit test 10								1.000	.256	.291	.071	.149	.374	.282	.334	.202
9. Pimsleur List.									1.000	.360	.357	.335	.284	.335	.388	.411
10. Pims. Reading										1.000	-.136	.103	.320	.287	.356	.316
11. Pims. Spking.											1.000	.367	.363	.380	.269	.432
12. Grade 1												1.000	.647	.543	.701	.545
13. Grade 2													1.000	.797	.874	.753
14. Grade 3														1.000	.882	.698
15. Grade 4															1.000	.751
16. Grade 5																1.000
17. Grade 6	.394	.658	.542	.769	.666	.438	.436	.439	.382	.380	.383	.086	.569	.720	.676	.756
18. Semester I	.430	.709	.594	.752	.702	.395	.381	.288	.384	.397	.245	.557	.693	.635	.728	.750
19. Semester II	.538	.728	.578	.797	.699	.382	.495	.216	.378	.385	.225	.566	.718	.689	.764	.820

	17	18	19
17.	1.000	.761	.818
18.		1.000	.895
19.			1.000

APPENDIX III

Intercorrelation Matrix: German

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. MLAT	1.000	.453	.505	.610	.241	.446	.462	.367	.377	.418	.656	.533	.613	.598	.442	.493
2. Unit test 2		1.000	.491	.510	.367	.405	.493	.468	.406	.412	.495	.326	.496	.408	.322	.340
3. Unit test 4			1.000	.572	.576	.508	.482	.595	.487	.567	.642	.540	.706	.498	.618	.626
4. Unit test 6				1.000	.534	.476	.665	.512	.649	.455	.567	.476	.659	.747	.662	.626
5. Unit test 7					1.000	.468	.473	.745	.663	.597	.529	.231	.540	.560	.644	.630
6. Unit test 8						1.000	.550	.586	.523	.424	.545	.203	.492	.430	.491	.504
7. Unit test 9							1.000	.589	.649	.357	.502	.385	.564	.626	.586	.622
8. Unit test 10								1.000	.696	.627	.553	.283	.570	.514	.575	.642
9. Unit test 11									1.000	.465	.507	.293	.575	.604	.687	.675
10. Grade 1										1.000	.705	.495	.689	.512	.466	.580
11. Grade 2											1.000	.609	.776	.734	.634	.626
12. Grade 3												1.000	.798	.591	.552	.537
13. Grade 4													1.000	.765	.757	.756
14. Grade 5														1.000	.721	.672
15. Grade 6															1.000	.854
16. Semester I																1.000
17. Semester II	.546	.459	.610	.716	.685	.541	.692	.678	.769	.605	.701	.608	.825	.828	.875	.900
18. Pimsleur List.	.687	.537	.607	.732	.611	.574	.572	.570	.553	.621	.694	.467	.625	.697	.619	.729
19. Pims. Reading	.228	.897	.144	.266	.241	.066	.189	.188	.934	.391	.392	.322	.241	.234	.216	.156
20. Pims. Spking.	.526	.093	.690	.606	.559	.784	.402	.568	.575	.546	.677	.190	.598	.472	.719	.566

	17	18	19	20
17.	1.000	.743	.261	.720
18.		1.000	.294	.767
19.			1.000	.565
20.				1.000

APPENDIX IV

Intercorrelation Matrix: Spanish

Variable	1	2	3	4	5	6	7	8	9	10	11
1. MLAT	1.000	.610	.356	.547	.307	.509	.431	.534	.496	.601	.712
2. Comptest 1		1.000	.622	.609	.422	.743	.553	.698	.498	.494	.659
3. Comptest 2			1.000	.589	.404	.625	.465	.459	.236	.259	.279
4. Comptest 3				1.000	.682	.734	.557	.661	.562	.606	.673
5. Comptest 4					1.000	.547	.311	.318	.324	.453	.474
6. Comptest 5						1.000	.491	.685	.405	.397	.633
7. Comptest 6							1.000	.817	.249	.459	.353
8. Comptest 7								1.000	.367	.520	.532
9. Pimsleur List.									1.000	.557	.662
10. Pims. Reading										1.000	.766
11. Pims. Spking.											1.000

BIBLIOGRAPHY

1. Ausubel, David P. The Psychology of Meaningful Verbal Learning. Grune and Stratton, 1963, Chapter 8.

2. Allen, Edward. "The Effects of the Language Laboratory on the Development of Skill in Foreign Language." Modern Language Journal 44: 355-57; 1960.

3. Bauer, Eric. "A Study of the Effectiveness of Two Language Laboratory Conditions on the Teaching of Second Year German." International Review of Applied Linguistics. 2: 99-112; 1964.

4. Birkmaier, Emma and Lange, Dale. "Foreign Language Instruction." Review of Educational Research 37: 186-99; 1967.

5. Blickenstaff, C. B. "The 'Lorge' Report." 4N 10: 9; 1964.

6. Brooks, Nelson. Language and Language Learning. New York: Harcourt, Brace and World, Inc., 1964, Chapter 4.

7. Buch, J. N. An Experimental Project to Measure Certain Facets of Language Growth for High School Students in Beginning French When Variations of Language Laboratory Equipment are Utilized in the Instructional Process. Harrisburg, Pa.: Dept. of Public Instruction, 1963.

8. Bumpass, Donald E. An Appraisal of Language Laboratories in Public Schools in the United States. (Unpublished Ph.D. Dissertation) Texas Technological College, 1963, Chapter 2.

9. Carroll, J.B. and Sapon, S.M. Manual for The Modern Language Aptitude Tests, Psychological Corporation, 1959.

10. Carroll, John B. and Sapon, S.M. The Modern Language Aptitude Test, Form A. New York: The Psychological Corporation, 1958.

11. Carroll, John B. "Research on Teaching Foreign Languages," in N.L. Gage (ed.) Handbook of Research on Teaching. New York: Rand McNally Co. 1963, Chapter 21.

12. Carroll, John B. "Research on Foreign Language Teaching: The Last Five Years." Reports of the Working Committees: Northeast Conference on the Teaching of Foreign Languages. Robert G. Mead, Jr., Ed., 1966, George Banta Co., Inc.: Mensha Wisconsin. Pages 13-42.

13. Cook, H. Robert. The Effects on Learning of Structural Drills in Spanish Broadcast via High Frequency AM Radio. USOE Report, Grant No. 7-24-0210-200. 1964.

14. Gaarder, Bruce A. "Language Laboratory Techniques: The Teacher and the Language Laboratory." International Journal of American Linguistics 26: 41-50; 1960, Part II.

15. Gaarder, Bruce A. and Hutchinson, Joseph C. A Pilot Survey of Foreign Language Teaching Equipment in 16 States. mimeo, n.d.

16. Hayes, Alfred S. Language Laboratory Facilities: A Technical Guide for the Selection, Purchase, Use and Maintenance. Washington, D. C.: USOE Bulletin No. 37, 1963, Chapter 3.

17. Hayes, Alfred S., Lambert, Wallace E., and Tucker, Richard G. "Evaluation of Foreign Language Teaching." Foreign Language Annals. 1:22-44; 1967.

18. Hocking, Elton. "Language Laboratory Experimentation." International Journal of American Linguistics. 32:80-91; 1962.

19. Hocking, Elton. Language Laboratory and Language Learning, Monograph II. Washington, D.C.: DAVI of NEA, 1967 (Second Edition) Chapter 2.

20. Hocking, Elton, Birkmaier, Emma and Smith W.F. "The Language Laboratory Comes of Age." (Mimeo) 1967.

21. Hutchinson, Joseph C. The Language Laboratory: How Effective Is It? Washington, D.C. USOE, 1964.

22. Hutchinson, Joseph C. "The Language Laboratory: Equipment and Utilization," in A. Valdman (ed.) Trends in Language Teaching, New York: McGraw-Hill Book Co., 1966, Chapter 12.

23. Johnson, Mary R. "Tape Recorder Versus Non-Record Laboratory." French Review 39:899-905; 1966.

24. Keating, Raymond F. A Study of the Effectiveness of Language Laboratories: A Preliminary Evaluation in Twenty-one School Systems of the Metropolitan School Study Council. New York: Institute of Administrative Research, Teachers' College, Columbia University. 1963, Chapters 3 and 4.

25. Lado, Robert. Language Teaching. New York: McGraw-Hill Book Co., 1964, Chapters 4 and 17.

26. Lambert, Wallace E. "Psychological Approaches to the Study of Language: Part II: On Second Language Learning and Bilingualism." Modern Language Journal 47 (3): 114-121; 1963.

27. Lorge, Sarah W. "Language Laboratory Research Studies in New York City High Schools: A Discussion of the Program and Findings." Modern Language Journal 48: 409-19; 1964.

28. Mathieu, Gustave. "Language Laboratories." Review of Educational Research 32: 168-78; 1962.

29. Neidt, Charles O. and Hedlund, Dalva E. "Student Reaction to High School Language Laboratory Activities." Modern Language Journal 49: 471-75; 1965.

30. Parker, William R. The National Interest in Foreign Languages (Third Revised Edition) Washington, D.C.: Department of State. 1962, Chapters 1 and 3.

31. Pimsleur, Paul. Pimsleur Language Proficiency Tests (French, German, Spanish) Form A. New York: Harcourt, Brace and World, Inc., 1967.

32. Pimsleur, Paul. Manual for the Pimsleur Language Proficiency Tests. New York, Harcourt, Brace and World, Inc., 1967.

33. Pimsleur, Paul. "Student Factors in Foreign Language Learning." Modern Language Journal 46: 160-70; 1962.

34. Politzer, Robert. "Assiduity and Achievement." Modern Language Journal 44: 14-16; 1960.

35. Rivers, Wilga. The Psychologist and the Foreign Language Teacher. Chicago. University of Chicago Press, 1964, Chapters 2, 9, and 16.

36. Sawyer, Jesse O. "Foreign Language Instruction." Review of Educational Research 34: 203-10; 1964.

37. Scherer, George A.C. "Uses and Misuses of the Language Laboratory." German Quarterly 38: 305-8; 1965.

38. Siegel, Sidney. Non-Parametric Statistics for the Behavioral Sciences. New York: McGraw-Hill Book Co., 1956.

39. Smith, Phillip D. Teaching A Modern Foreign Language via Telephone. (Unpublished Ph.D. Dissertation) The Ohio State University, 1967.

40. Smith, W. Flint. A Comparison of the Conventional, Fixed Language Laboratory Installed Versus the Electronic Classroom and Their Contribution to Achievement in Understanding and Reading a Foreign Language: A proposal for research. (Mimeo) 1966.

41. Stack, Edward M. Language Laboratory and Modern Language Teaching. Oxford Press: New York, 1966, Chapter 7.

42. Young, Clarence W. and Choquette, Charles A. "An Experimental Study of the Relative Effectiveness of Four Systems of Equipment for Self-Monitoring in Teaching French Pronunciation." International Review of Applied Linguistics 3: 13-49; 1965.

43. White, Wayne H. A Comparison of Two Methods of Teaching Beginning Spanish in Junior High School. (Unpublished Ph.D. Dissertation) University Microfilms, Ann Arbor Michigan. Chapter 1-3.

44. Winer, B.J. Statistical Principles in Experimental Design. New York: McGraw-Hill, 1962.

Instructional Materials:

A-LM Materials, French Level I. New York, Harcourt, Brace and World, Inc., 1962.

A-LM Materials, German Level I. New York, Harcourt, Brace and World, Inc., 1962.

A-LM: Teachers Manual, French and German Level I. New York: Harcourt, Brace and World, Inc., 1961.

La familia Fernandez. Chicago: Encyclopedia Britannica Films, Inc., 1963.